Installation, Operation & Maintenance Instructions

ROTARY 1/4 TURN MODULAR SPRING RETURN.

Suitable for use in safe area and hazardous gas/dust atmospheres (ATEX / UKEX)

GENERAL SPRING RETURNS & INPUT/OUTPUT VARIANTS.

NOTE : FOR APPLICATIONS REQUIRING FUNCTIONAL SAFETY APPLICATION TO IEC 61508, REFER TO PRODUCT SAFETY MANUAL TD170 FOR RELEVANT DETAILS IN ADDITION TO DETAILS GIVEN IN THIS DOCUMENT.

Contents:

1. Spring Core Assembly.

The design of the Kinetrol modular spring return contains the same clock spring type as the non-reversible design (described in TD129) and the working principle remains the same.

This version of the spring contains a core assembly to which the input and output devices can be added, removed or interchanged with various functional types without the need for a separate 'keeper plate'. It includes a torque retaining feature (coupling stop). The fixed angle of travel within this module is 97° or 90° as standard - other angles are available on request.

Figures 1a &1b show an open end view and cross-section through the reversible spring core modules.

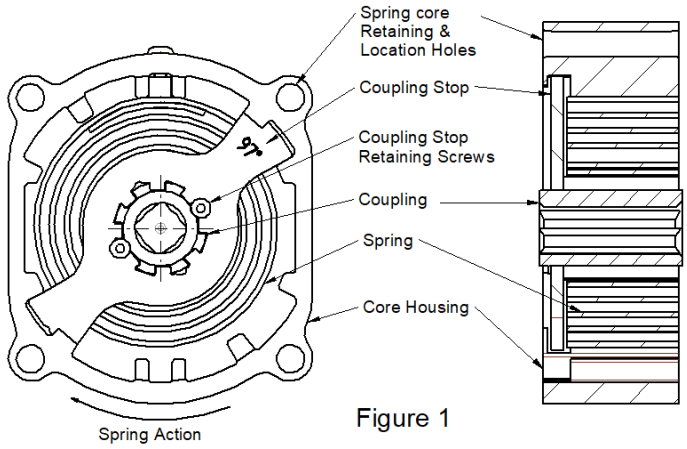


Figure 1

The spring torque ensures the coupling stop rests against the two stop surfaces as shown above. This allows the spring to be removed safely from it's application. The coupling stop is retained to the coupling by two or four fasteners. The coupling contains a through square drive which allows the spring to be fitted either way around (ie for reversible clockwise or anticlockwise movement). The Core can be fitted with input & output flanges of various types as described in later sections.

The coupling stops may be removed for spring tension adjustment. The description of how to achieve this is described in Chapter 4. The standard angle of travel for actuated fitment is 97°. Options are available as standard (90° & 97°). 90° is normally used for manual drive options. 97° is normally used for actuated options to allow angle of travel to be adjusted using the actuator travel stops, however, if no adjustment is required, the 90° option can be used with an actuator.

The core housing contains 4 equispaced screws clearance holes which allow the module to be clamped between the input and output components as described in the following chapters.

2. Actuator Input.

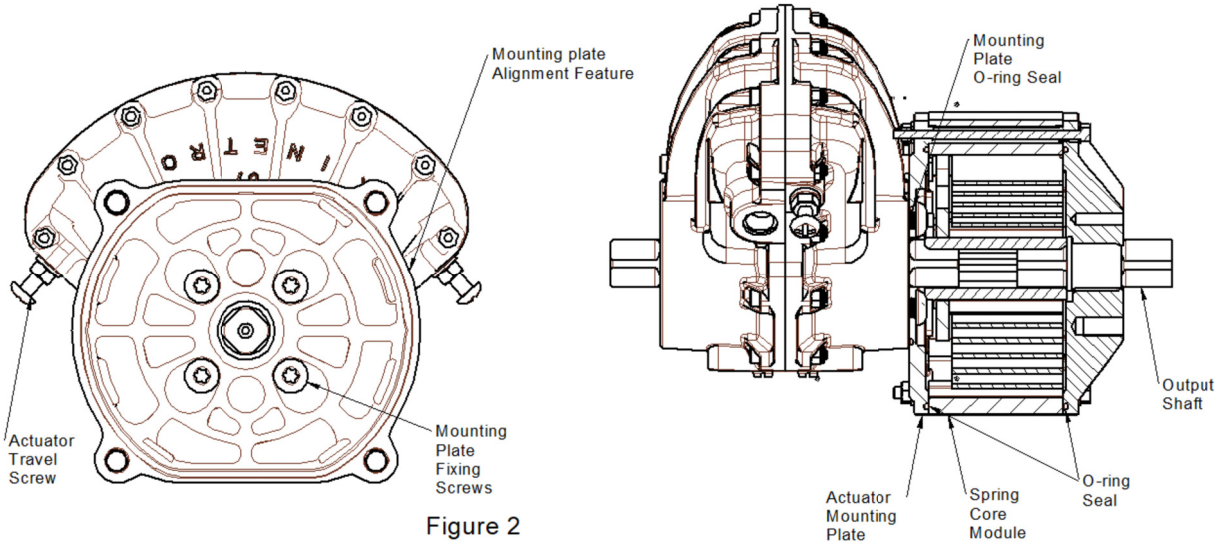


Figure 2

To assemble the Kinetrol actuator to the Modular Spring:

2.1 Securely support the actuator with the drive square facing upward (preferred method fit the other side of actuator to a bracket and secure bracket to a work bench.
2.2 Fit the mounting plate with o-ring and fixing screws. Ensure the radiused alignment feature points towards the travel stop screws of the actuator. Fit supplied screws using low strength thread adhesive and torque tighten to TD111.
2.3 Turn the actuator output square to unpressurised end of spring stroke and unscrew travel screw at this end, counting three complete turns.
2.4 Fit the spring core module o-ring seal correctly in its groove in the baseplate and slide the spring core module over the actuator square ensuring the radial and flat sides with the same baseplate alignment features.
2.5 Fit the desired output drive (see section 3) to the spring core module and whilst holding the nuts and washers in place tighten the four fixing screws using low strength thread adhesive to the torque shown in Table 1 below. Note that the size 15 does not use nuts & washers.
2.6 Return the actuator travel screw (3 turns) to its original position and lock.
2.7 Pressurise the actuator to check the spring functions correctly.

CAUTION:
Never hammer or use other undue force on spring diecast mounting plate, output drive flanges or spring module. End loading of spring module coupling should be avoided.

Module Corner Fixing Screws					
		Spring Size			
		03/05	07/08		14/15
Screw size	ISO	M4	M5		M10
Screw Torque	(Nm)	1.7	5.7		33
	(ibfin)	15	50		292

Table 1

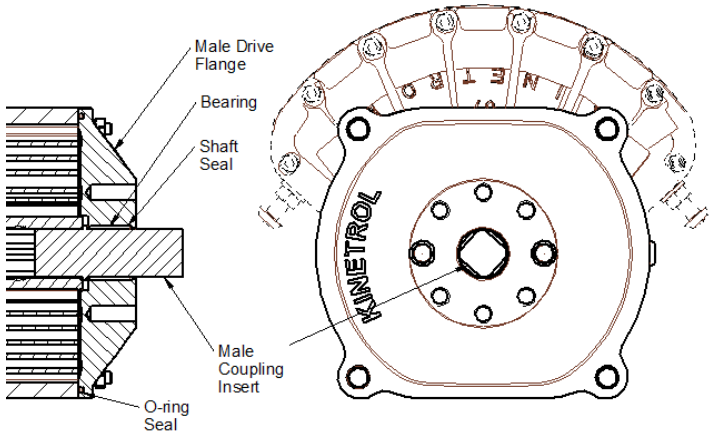
3. Male & ISO Female Flange Assemblies.

In Figures 3 & 4, the output drives can be seen configured to suit the application. These are most common Kinetrol outputs options but others are available on request.

To assemble:

3.1 The coupling must first be inserted into the flange bearing and care must be taken not to damage the shaft seal.
3.2 Insert the static o-ring seal into the groove in the flange.
3.3 Fit the 4 corner screws through the flange holes.
3.4 Refer to Input Drive section in 2.5 for remaining assembly sequence.

Note: It is essential that the full number of screws are used when mounting the spring interface to valve and all tightened evenly. Refer to TD111.



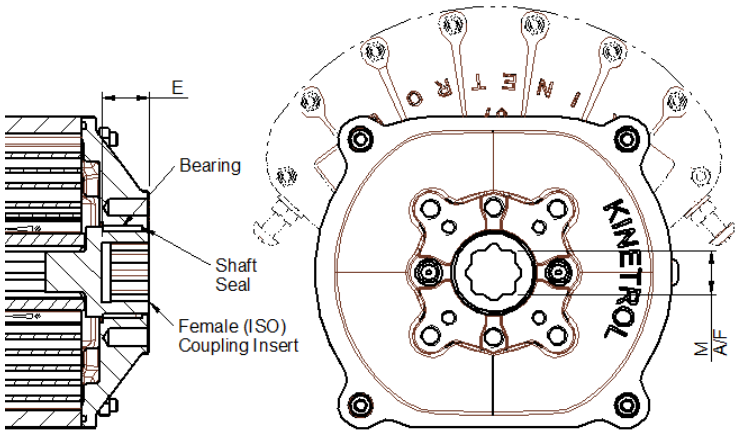
Kinetrol Male Drive Flange Assembly
Figure 3

Mounting hole sizes for ISO adaptor addition:
refer to Kinetrol technical data sheet TD128.

Mounting hole sizes – Kinetrol Male Spring

Model	Number of Holes	ISO Thread	Thread Depth (mm)	PCD (mm)	ANSI Thread (UNC)	Thread Depth (“)	PCD (“)
03	4	M5	10	31.1	10-24	0.39	1.225
05	6	M5	10	34.9	10-24	0.39	1.375
07	4	M8	16	50.8	5/16-18	5/8	2
08	4	M8	16	70.0	5/16-18	0.63	2.76
15	4						

Table 2



Female (ISO) Drive Flange Assembly
Figure 4

Mounting hole sizes for ISO adaptor addition:
refer to Kinetrol technical data sheet TD128.

Mounting hole sizes – DIN/ISO Spring Flange
Metric & English

Model	ISO Flange	Number of Holes	Thread		Thread Depth		PCD		E		M	
			ISO	UNC	(mm)	(inch)	(mm)	(inch)	(mm)	(inch)	(mm)	(inch)
03/05	F03/05/07	4	M5/M6/M8	10-24,¼,5/16	10/12/13	0.39/0.47/0.51	36/50/70	1.42/1.97/2.76	12/16 (03/05)	0.47/0.63 (03/05)	11/14 (03/05)	0.433/0.551 (03/05)
	F04	4	M5	10-24	10	0.39	42	1.65				
07/08	F05/07	4	M6/M8	¼ 5/16	12/13	0.47/0.51	50/70	1.97/2.76	19	0.75	17	0.669
15	F14	4	M16	5/8	28	1.1	140	5.51	38	1.5	36	1.42

Table 3

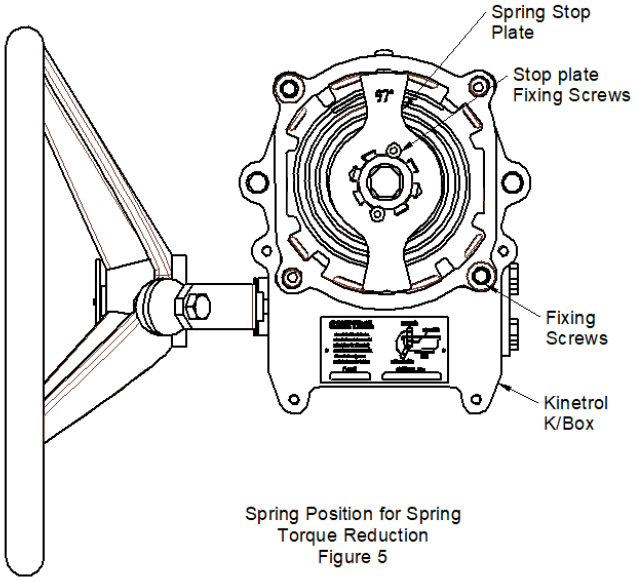
4. Spring Tension (Torque) Adjustment.

WARNING: The wound steel spring stores large amounts of energy which, if suddenly released, can be dangerous. If in doubt contact Kinetrol.

The following procedure allows the spring tension to be reduced or increased in 90° increments.

4.1 Detach spring core from valve or mechanism ready for attachment to a Kinetrol K-Box gear unit.
4.2 Fit a male drive flange, shown in Figure 3, to the baseplate of a suitable size K-Box and insert the male drive coupling insert into the K-Box Coupling. Fit the K-box baseplate to the gearbox and securely fix to Bench or other suitably stable surface such that the spring flange faces upwards and the handwheel can freely rotate.
4.3 Fit the spring to be retensioned to the flange with the spring stop plate facing upwards as shown in Figure 5. Retain using at least 2 core assembly screws and use larger washers to ensure the screws clamp over the larger holes.
4.4 Wind the handweel to rotate the spring near the centre position.
4.5 Remove the stop plate fixing screws and remove the stop plate.
4.6 The spring centre can now rotated in 90°increments to increase or reduce spring torque.
4.7 When the desired retorque has been achieved, replace the spring stop plate and secure by reusing the stop plate screws with thread locking adhesive.
4.8 The K-Box handle can now be rotated such that the stop plate rests against the housing.
4.9 Remove the housing fixing screws and remove the spring core unit.

Note: This is the procedure recommended for spring core retensioning for all applications including manual handle & fire-fail-safe and actuated.



Spring Position for Spring Torque Reduction
Figure 5

5. Manual Handle Input Assembly.

The manual handle option is intended to allow manual override of the spring action for temporary operation. It is achieved by the operator pulling on the handle whilst stood in a stable position and rotating the handle by 90°.

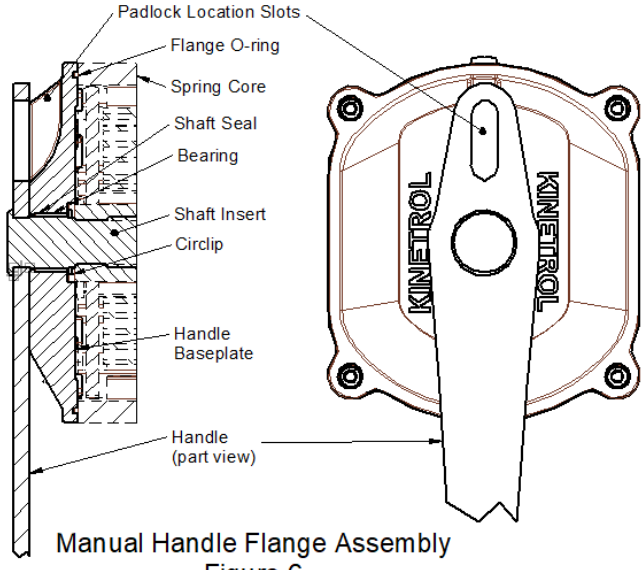
Care must also be taken during handle release as the rotation of the handle without control will result in fast handle movement which could be hazardous to anything in its path. Sudden release might also result in permanent deformation of the spring assembly or valve and attachment.

The handle option has provision for a padlock to be fitted through slots in the handle and base-plate. This allows the handle to be secured to prevent unauthorised operation. A pad-lock with a 10mm (3/8") max shackle diameter can be used.

The handle and shaft insert is manufactured from stainless steel and handle grip is electrically conductive which allows it to be ATEX Cat 2 approved as standard.

Assemble the manual handle from a spares kit of parts as follows:

5.1 Slide the handle over the shaft insert and press into place.
5.2 Slide the shaft insert into the base-plate and through the seal and bearing (take care not to damage o-ring seal) and retain using the external circlip.
5.4 Fit the base-plate/handle assembly to the spring core assembly ensuring the flange o-ring is in place and the handle is pointing in the desired direction Such that the padlock holes are aligned. Use 90° stroke core.
5.5 Fit the output drive (see section 3) to the spring core assembly. Whilst holding the nuts and washers in place tighten the four fixing screws using low strength thread adhesive to the torque stated in Table 1.



Manual Handle Flange Assembly
Figure 6

6. Fire Fail-safe input Assembly.

Figure 7 shows two views of the Fire fail-safe option which is mounted to a 'male drive flange' via a mount plate. A shaft insert fits through the main lever and through the flange bearing & seal and is retained by a circlip.

90° Travel spring module is reccommended for use with this assembly but 97° module can be used if slight overtravel is not regarded as a problem.

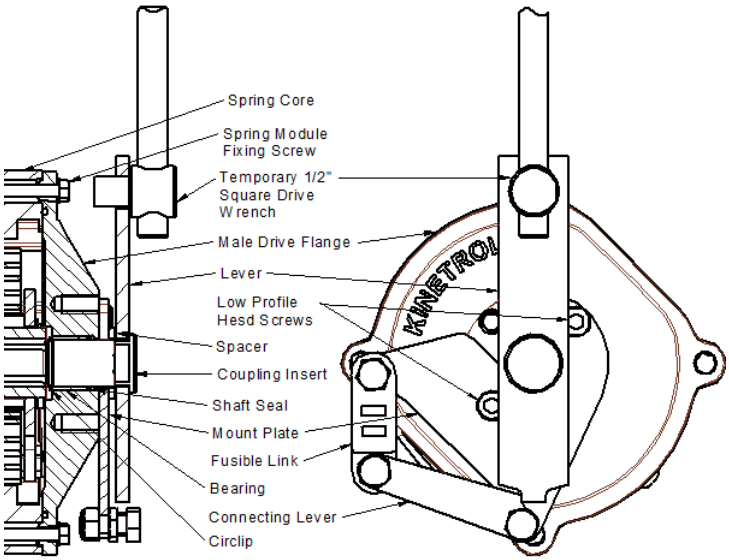
The spring torque causes the lever to act against a connecting lever which in turn applies tension to the fusible link. In the event of an environmental temperature greater than the link solder melting point, the link splits into two and the spring rotates the shaft to a safe position.

The parts are reversible by simply reversing the connecting lever and fusible link screws in their respective mounting holes.

Fusible links are available for 74° & 100°C as standard.

To assemble:

6.1 Pass the spring module fixing screws & washers through the flange outer holes.
6.2 Fit the mounting plate to the drive flange using low profile head screws and thread adhesive in the desired orientation.
6.3 Fit one end of the Fusable link and Connecting Lever to the plate using screws provided in the correct orientation for the spring direction required.
6.4 Pass the shaft Insert through the lever and add spacer.
6.5 Pass the shaft Insert through the bearing & shaft seal (take care not to damage the shaft seal) and fit Circlip to secure.
6.6 Fit the output drive (see section 3) to the spring core module. Whilst holding the nuts and washers in place tighten the four fixing screws using low strength thread adhesive to the torque stated in Table 1.
6.7 The module can now be fitted the valve or later after the link has been energised.
6.8 Secure the assembly to a bench or in a vice.
6.9 Fit a ½" square drive torque wrench in the lever and rotate the spring by 90° to allow the connecting lever hole to align with a hole in the fusable link and fit the retaining screw and nut.



Fire Fail-Safe Link Module
Figure 7

7. Materials of Construction.

7.1 Spring Module.

Spring Housing – Aluminium Alloy
Inner Coupling – Aluminium Alloy
Spring & Backing Plate – Carbon Spring Steel
Coupling Stop – Low Carbon Steel
Grease

7.2 Actuator Mounting Input Option.

Baseplate – Aluminium Alloy
Fixing Screws – Stainless Steel
Flange Seals. - Low Temperature (-54 to -60°C) – EPDM Rubber
Standard Temperature (-40 to +80°C) – NBR Rubber
High Temperature (-20° to 100°C) – Fluorocarbon Rubber

7.3 Male & Female Output Flanges.

Output Flange – Aluminium Alloy
Coupling Insert – 303 Stainless Steel.
Flange & Shaft Seal - Low Temperature (-54 to -60°C) – EPDM Rubber
Standard Temperature (-40 to +80°C) – NBR Rubber
High Temperature (-20° to 100°C) – Fluorocarbon Rubber
Bearing – Sintered Bronze backed Steel.

7.5 Manual Handle Input Option.

Flange – Aluminium Alloy
Coupling Insert – 303 Stainless Steel
Handle – 304 Stainless Steel
Handle Cover – Charge dissipative PVC
Flange & Shaft Seal -Low Temperature (-54 to -60°C) – EPDM Rubber
Standard Temperature (-40 to +80°C) – NBR Rubber
High Temperature (-20° to 100°C) – Fluorocarbon Rubber
Bearing – PTFE/Bronze backed Steel.

7.6 Fire-Fail-safe Input Option.

Flange – Aluminium Alloy
Coupling Insert – 303 Stainless Steel
Lever 304 Stainless Steel
Flange & Shaft Seal - Low Temperature (-54 to -60°C) – EPDM Rubber
Standard Temperature (-40 to +80°C) – NBR Rubber
High Temperature (-20° to 100°C) – Fluorocarbon Rubber
Bearing – PTFE/Bronze backed Steel.
Link -304 Stainless Steel
Thermal Link – Plated Steel (2 pieces) joined by specific melting point solder.

8. Labelling (ATEX & UKEX).

Kinetrol Springs with options described in this manual are approved for use in areas where explosive dusts or gases are present.

The marking shown below is contained within a label attached to the centre module. The label also indicates the direction of spring action with a warning about the potential dangers of energy stored in spring assemblies.

The first line of the label shows an 'X' which indicates Special Conditions for Safe Use. These are:

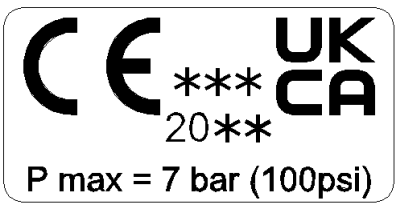
1) The maximum rubbing speed of any part of the assembly should not exceed 4 m/s.
2) Do not allow dust to build up on external surfaces.

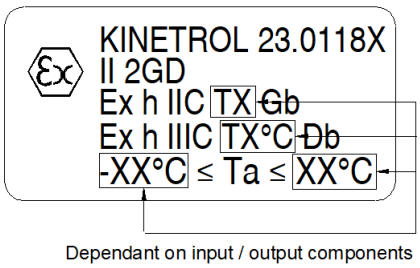
Ambient temperature range is dependent on the input/output components chosen and seals specified in them. The spring module has no rubber or plastic parts fitted and therefore the ambient temperature limitations are determined by the input and output assemblies fitted. These are listed as follows:

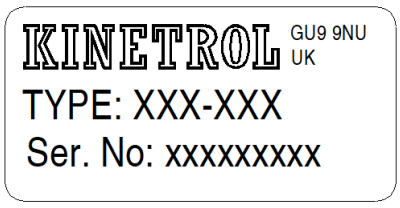
Actuator fitment: Standard seals: -40°C < Ta < +80°C. Fbr seals: -20°C < Ta < +100°C. Low temperature: -54°C < Ta <+60°C

Manual Handle: Standard seals: -40°C < Ta < +80°C. Low temperature: -54°C < Ta < +60°C

Fire-fail-safe: 74°C Link Yield: -40°C < Ta < + 38°C 100°C Link Yield: -40°C < to < +66°C







9.Part Codes & Spare Parts.

ITEM NO.	DESCRIPTION		SPARE PART NUMBERS FOR MODULAR SPRING ASSEMBLIES								
			03	05	07						15
1	Spring Core Assembly	97° Travel	03#-0R0	05#-0R0	07#-0R0						15#-0R0
		90° Travel	03#-0R0-90	05#-0R0-90	07#-0R0-90						-
2	Actuator Mounting Plate & Fixings		SPR03#-0001	SPR05#-0001	SPR07#-0001						SPR15#-0001
3	Kinetrol Male Output Flange Assembly		SPR03#-0002	SPR05#-0002	SPR07#-0002						SPR15#-0002
4	Female Output Flange Assembly		SPR03@F0002	SPR05@F0002	SPR07@F0002						SPR15@F0002
5	Manual Handle Input Assembly		SPR03#-1006	SPR05#-1006	SPR07#-1006						-
6	Fire Fail-safe Input Assembly 74°C Link		SPR03#-0074	SPR05#-0074	SPR07#-0074						-
7	Fire Fail-safe Input Assembly 100°C Link		SPR03#-0100	SPR05#-0100	SPR07#-0100						-

Note: In table above:- # Is replaced by 4 for metric threads & 7 for ANSI threads.
@ Is replaced by 3 for metric threads & 7 for ANSI threads.